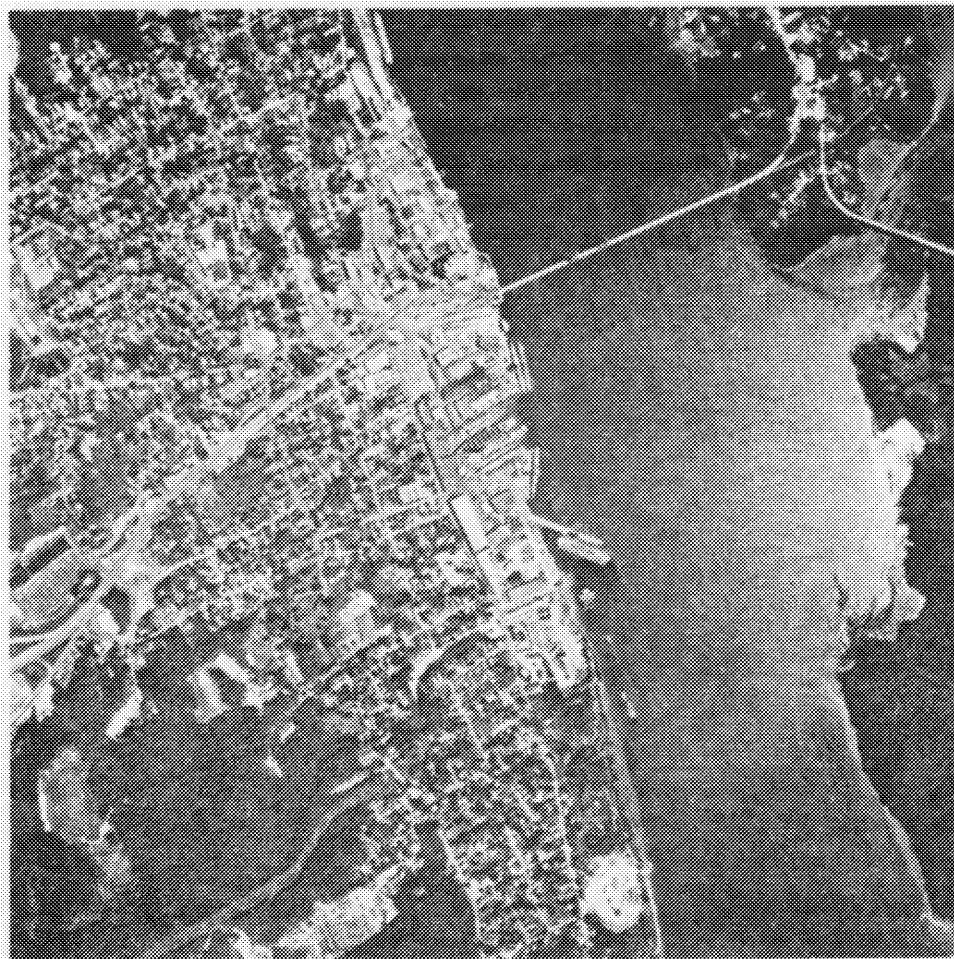
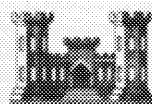


PERG DIV FILE

KENNEBEC RIVER MAINE RECONNAISSANCE REPORT

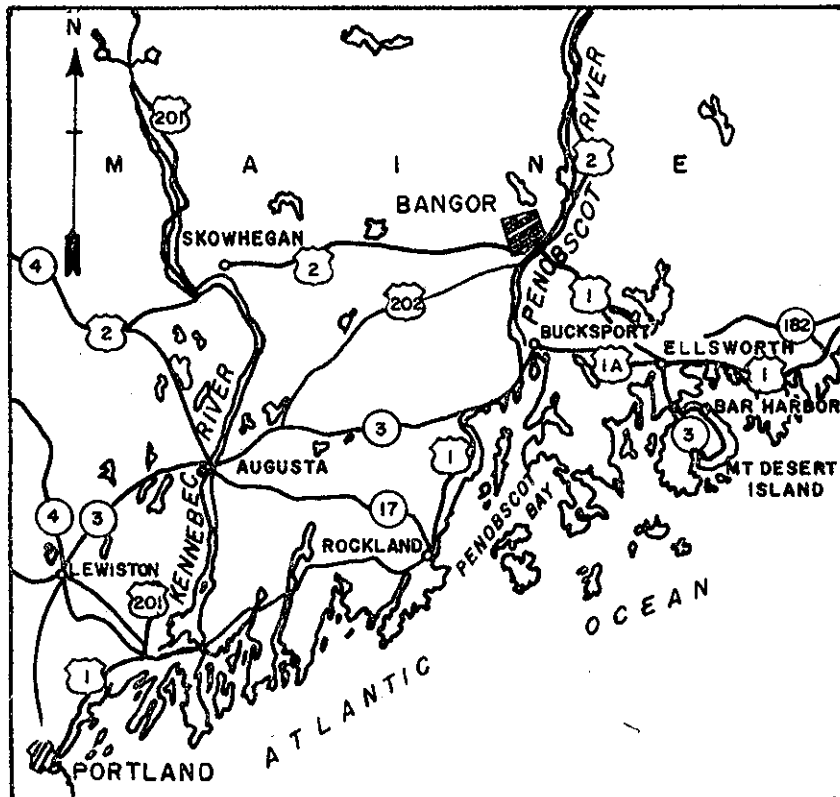


NEW ENGLAND DIVISION



AUGUST 1979

RECONNAISSANCE REPORT
OPERATION AND MAINTENANCE
KENNEBEC RIVER MAINE



U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
424 TRAPELO ROAD
WALTHAM MASSACHUSETTS 02154

AUGUST 1979

PROJECT AUTHORIZATION

Federal participation in navigation on the Kennebec River was initiated in 1827 when authorization was given to remove obstructions from the river at Lovejoy's Narrows. Since that time, twenty improvements have been authorized, and nine survey investigations have been done, and four major modifications have been authorized and constructed (1902, 1907, 1913 and 1940). In all, modifications and additions were authorized by River & Harbor Acts of August 30, 1852, June 23, 1866, July 11, 1870, March 3, 1871, March 3, 1873, March 3, 1881, August 11, 1888, June 13, 1902, March 2, 1907, March 4, 1913 & October 17, 1940. The 1940 River and Harbor Act authorized the 27-foot channel that currently exists.

This reconnaissance report on operation and maintenance was authorized by Section 216 of Public Law 91-611 for the purpose of reviewing the currently authorized Federal project and determining:

- (a) The level of continued operation and maintenance funding justified for budgetary purposes.
- (b) How well selected projects are serving authorized purposes.
- (c) What other purposes are being or could be served.
- (d) The need, if any, for an in depth study to establish recommendations to Congress for project modification.

This study is being done in accordance with EC 1130-2-162 and EC 1130-2-171.

PROJECT DESCRIPTION

Regional Description

The Kennebec is the third largest river of New England, the Penobscot being second and the Connecticut first. It lies between the Penobscot and the Androscoggin Basins, as shown by Figure 1. The source is Moosehead Lake; above the lake the name becomes Moose River. The headwaters are in the high country between Maine and the Province of Quebec, and are about 2,000 feet above sea level. The outlet of Moosehead Lake is about 120 miles above Augusta, where tidewater begins, and Augusta is about 44 miles from the mouth of the river, making the total length about 164

miles. About 20 miles above its mouth the Kennebec passes through an open stretch of water known as Merrymeeting Bay, the western end of which receives the waters of the Androscoggin. The two rivers, united under the name of the Kennebec, then continue their course until they empty directly into the open Atlantic.

The most important tributaries are Dead River and Sandy River, both of which flow in from the west, and the Sebasticook River, which comes from the east.

Federal Project

The Federal project provides for a channel 27 feet deep and not less than 500 feet wide, extending from the mouth to a point about 0.6 of a mile above the bridge at Bath; thence to Gardiner a channel not less than 150 feet wide and 17 feet deep at Beef Rock Shoal at the foot of Swan Island, 18 feet through the rock at Lovejoy Narrows, decreasing to 16 feet at Gardiner; a channel west of Swan Island 100 feet wide, 12 feet deep, except at the upper shoal, where the depth was to be 15 feet; and a channel from Gardiner to Augusta (head of navigation), 125 feet wide and 11 feet deep. The work included dredging, rock excavation and construction of two training walls. The improvement and maintenance of the channel west of Swan Island was recommended for abandonment in 1917. The portion of the 27-foot channel above the bridge at Bath which was authorized in 1940 is considered to be inactive. The limits and extent of the Federal project are depicted graphically on Figure No. 1.

AREA SERVED

The area served by the project is shown on Figure No. 1. Perhaps the most dominant use area is the town of Bath. The river also flows through the State capitol at Augusta and the Federal channel in that area is authorized to -11 feet m.l.w.

EXISTING CONDITIONS

Except for vessels being constructed or repaired at Bath Ironworks, traffic on the Kennebec River has decreased significantly over the past years. Total commerce activity on the Kennebec has decreased from 225,496 tons in 1939 to 8,147 tons in 1977.

The activity at Bath Ironworks, however has continued at a very active pace through the years.

Several naval vessels requiring up to 27-foot draft are built

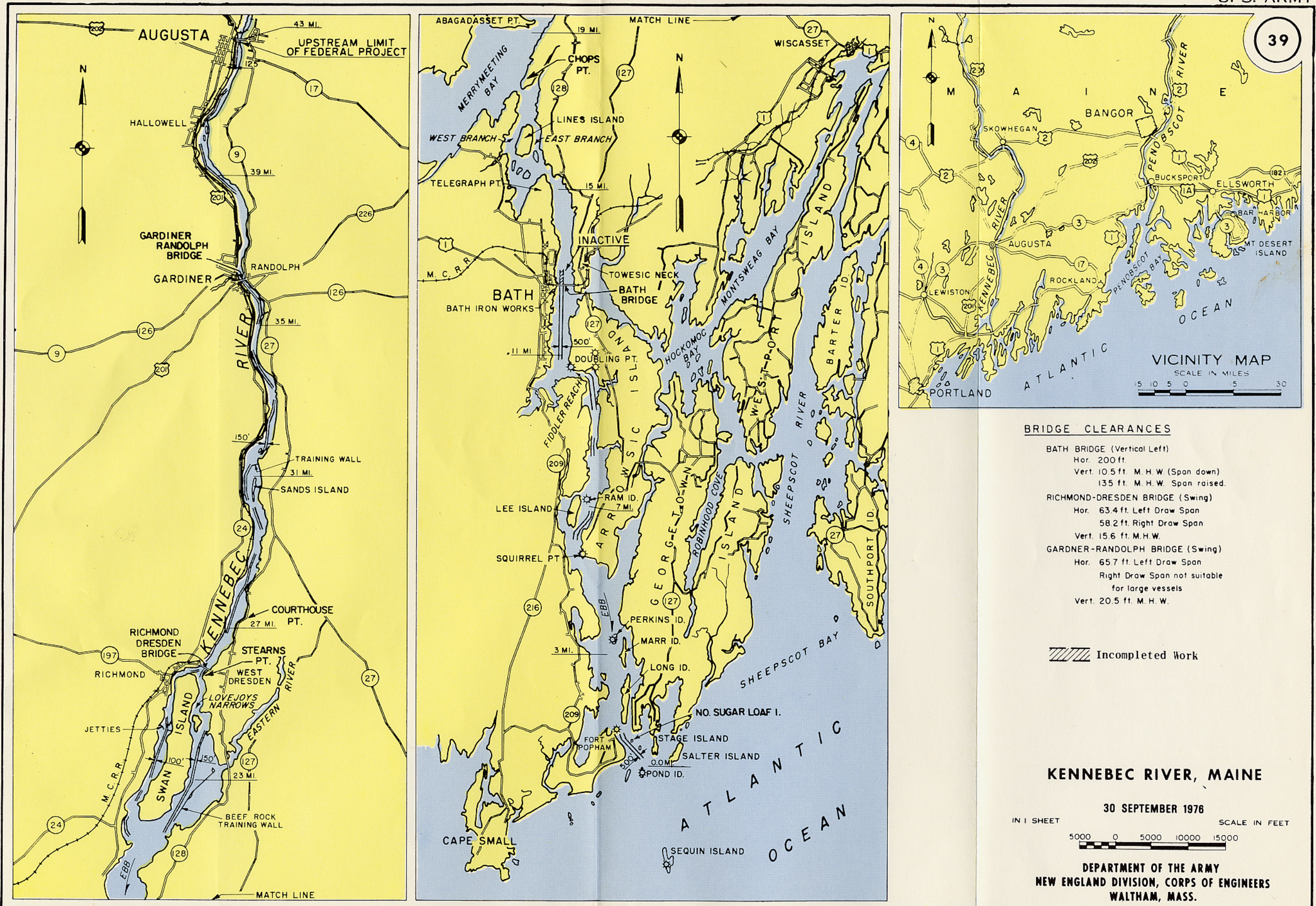


Figure 1

or serviced at the Bath Ironworks Corporation shipyards yearly. The ironworks has a backlog of work through 1982 consisting of work on at least 24 major vessels. A recent letter outlining their anticipated harbor traffic is reproduced in Appendix No. 1. The ironworks, the largest employer in the State of Maine, employ a large group of local residents and the economic life of the area depends greatly on the continued success of the operations there. Bath Ironworks is also of considerable national strategic value in the construction and rehabilitation of vessels for the U.S. Navy.


Just north of the ironworks is the Stinson Canning Co. It is a medium size cannery having having approximately 50,000 sq. ft. of building space. A conservative estimate of the amount of fish processed in this cannery is 20,000,000 lb/year.

Other smaller operations are scattered up and down the river consisting mostly of marinas.

Many wharf facilities and terminals currently lie dormant along the river. A large decrease in the movement of coal, petroleum products, pulpwood, and other timber products over the last 40 years has decreased the total usage of the river significantly.

As previously mentioned, many vessels being constructed or rehabilitated at Bath Ironworks require a draft of up to 27 feet to navigate the river safely at low water. Recent hydrographic surveys indicate shoaling at the river in the areas of Doubling Point and Fort Popham that allows the passage of deep draft vessels in the Kennebec from Bath Ironworks only at high tide. The company has requested that the Corps do maintenance dredging in these areas to allow safe passage of vessels under all tidal conditions.

The Bath Ironworks could not relocate their operations to any other location. They have too much invested at their present location. Lack of adequate access would make their business activities impossible to conduct.

Other types of traffic currently utilizing the Kennebec River are having no problem navigating under present conditions 

PROJECT MAINTENANCE

The history of project maintenance is extensive. For an adequate picture of maintenance needs and current maintenance requirements, the history of the project only since the completion of construction of the 27-foot channel in 1943 need be discussed.

The majority of the maintenance on this project has been on the 27-foot section. The most current request is also for this section of the river. The maintenance history is outlined in tabular form in Appendix 1. These historical maintenance figures were used to approximate a shoaling rate and to then approximate the quantity of dredging that would be required in any given year.

PRELIMINARY ECONOMIC EVALUATION

The economic viability of the Kennebec River project will be evaluated by comparing the benefits that will be derived through continued maintenance of the channel to the annual cost of this maintenance work. Any funds already invested in the project will be considered sunk costs and will not be included in this evaluation.

Current shoaling conditions in the channel are limited to a few locations, but are sufficient to cause significant problems for Bath Ironworks, the major channel user and the largest business in the State of Maine. The firm employs approximately 5,500 persons, either directly or indirectly involved in the process of shipbuilding or repair, with an estimated 1980 payroll of \$80,000,000. Located in the town of Bath, with a 1975 population of only 9,747, it is obvious that this enterprise is the foundation of the local economy. At the present time, Bath Ironworks is building 20 vessels and has secured contracts for an additional fourteen drawing up to 26 feet of water.

The river channel is frequently utilized by Bath Ironworks for trial cruises of ships under construction at various stages of completion. Approximately seven trials per vessel are scheduled at high tides during daylight hours to prevent groundings.

When high tides scheduled for trial cruises are accompanied by a heavy fog, as is often the case during early morning hours along the Maine Coast, the crossing must be postponed to a later date. Since a crew is engaged for a full day's service in advance, the crew must be paid even though the crossing is not accomplished. Since many of the crew members are pulled off their regular duties at Bath Ironworks for the trial cruises, productivity of the firm is also decreased for that day. With proper maintenance of the channel, these costly delays would not occur because crossings would not require high water conditions.

Failure of the Corps of Engineers to continue the maintenance of the Kennebec River could result in one of the following future scenarios:

1. Use of the channel would continue as it presently does, despite costly time delays, safety hazards, and difficulty of navigation.
2. The scale of operation at Bath Iron Works would be reduced due to an ability to handle only smaller vessels than they currently do.
3. Maintenance operations in the channel would be undertaken by state or local authorities.

Because of the significance of the Ironworks to the local economy and the great demand for shipbuilding and repair facilities along the East Coast of the United States, it does not appear likely that conditions will be allowed to worsen to the point that activity would be curtailed. From a standpoint of pure economic efficiency, it is also unlikely that Bath Ironworks will continue to absorb frequent financial losses resulting directly from poor channel conditions. On the other hand, it does not appear that local authorities have the resources or the inclination to fund the necessary maintenance work at the present time.

As the following paragraphs will illustrate, the benefits of maintaining the Kennebec River Channel render the continuation of maintenance by the Corps of Engineers the most probable future. In addition to the monetary benefits which clearly outweigh the financial costs, continued Corps involvement will assist in ensuring for the future the high level of employment offerings and the contribution to regional income associated with Bath Ironworks.

Costs

Annual maintenance costs required to ensure adequate channel conditions in the Kennebec River have been estimated at approximately \$73,000. This estimate was based on the historical data presented in Table 1.

Table 1

Maintenance Costs - Kennebec River

Year	Cost	Average Annual Cost 1979 Dollars
1964-1967	\$ 94,000	\$189,880
1967-1968	\$ 47,000	\$ 91,180
1968-1971	\$130,000	\$215,800
1971-1975	\$242,000	\$304,920
Total	\$513,000	\$801,780

\$801,780

11 years = \$72,889, approximately \$73,000 per year.

Benefits

As indicated previously, the economic benefits directly attributable to the proper maintenance of the Kennebec River Channel would accrue to Bath Ironworks, primarily as a result of the elimination of costly time delays in the execution of trial crossings.

Discussions with administrative employees at Bath Ironworks have indicated that an approximate average of twelve days of scheduled trial cruises are lost each year due to the channel problems described. These same sources indicated that each day's loss was worth between \$40,000 and \$50,000 to the enterprise.

Depending on the size of the vessel being tested, trial crews range from 180 to 400 men per crossing, with an average crew of about 300. Each crew member is paid for an eight hour day at seventeen dollars an hour. Thus the annual loss is calculated as follows:

$$300 \text{ men} \times \$17/\text{hr.} \times 8 \text{ hrs./day} \times 12 \text{ days/yr} = \$489,600/\text{year}$$

An approximate annual benefit of \$490,000 appears to coincide closely with the firm's estimated loss per crossing delayed of \$40,000 to \$50,000 since it averages to a benefit of \$40,833 per crossing.

An additional benefit in the form of transportation savings could be expected as a result of proper channel maintenance. Additional expense to shippers is incurred when a vessel approaches the Kennebec River at low tide and is forced to wait for greater depth to enter. Local sources have indicated that approximately five times in an average year a vessel in this situation is not able to drop anchor or idle outside the river mouth due to unfavorable sea conditions, and is forced to cruise to Portland for protection. This trip requires approximately two to three hours cruising time at 15 knots, for a total of four to six hours including the return to the Kennebec River. Since fuel consumption is approximately 300 barrels per 24 hour day at 15 knots, approximately 63 barrels at \$15.00 per barrel are consumed by each vessel. For five vessels per year, the total annual transportation saving would therefore be approximately \$4,700.

Table 2

Benefits of Maintenance at Kennebec River

Increased Productivity	\$490,000
Transportation Savings	\$ 4,700
Total	\$494,700

Another benefit associated with the project which cannot be measured in economic terms is the potential importance of Bath Ironworks to national defense. If the United States were involved in a war which involved naval operations in the North Atlantic, Bath could become a very important location for ship building and repair for the U.S. Navy. It is one of the few locations in the area suited for these activities.

Economic Justification

The ratio of benefits to costs for the full annual maintenance of the Kennebec River Channel is:


$$\frac{\$494,700}{\$73,000} = 6.8$$

Thus, it appears that continued involvement in the project by the Corps of Engineers is economically justified.

PRELIMINARY ENVIRONMENTAL ASSESSMENT

The purpose of maintaining the authorized project in Kennebec River is to provide adequate depths that will allow deep draft vessels to navigate the channel for trial runs and access to and from the ship building industry in Bath. While any recreational facilities could possibly be transferred to other areas if maintenance dredging ceased, commercial interests located in Bath are economically dependent on continued use of the channel. It is impossible to relocate commercial facilities in Bath and any adverse effects on these industries could produce a slowdown of operations and a subsequent loss of employment.

Sediment composition from the mouth of Kennebec River to Bath is described as predominantly uniform medium to fine sand. The major impacts associated with dredging this type of material are increased turbidity and temporary degradation of water quality. There are no known significant shellfisheries resources within the project area that might be affected by dredging. However, the

 shortnose sturgeon (Acipenser brevirostrum) is found in the Kennebec River. This species is on the Federal Rare and Endangered Species List and as such requires careful consideration in terms of presence, habitat requirements and usage, and potential impacts on these parameters.

Historically, two disposal sites have been used in conjunction with dredging different sections of the Kennebec River. An area in the center of Kennebec River, approximately one-half nautical mile long in depths of water ranging from 90 to 112 ft. m.l.w., has been used for disposal of sediments dredged between Doubling Point and Bath. This disposal site runs from the southerly end of Morse Cove to approximately one-half nautical mile upstream of Bluff Head.

An ocean disposal site for other reaches of the river is located at a point 2.0 nautical miles from Pond Island Light and 1.75 nautical miles from Sequin Island. Water depths at this site range from 87 to 116 ft. m.l.w. Continued use of this ocean disposal site may meet with opposition from local fishing interests and an alternate disposal area may have to be identified. Selection of any disposal site, whether historic or new, will be coordinated with the State of Maine.

Any future dredging in the Kennebec River will require chemical-biological testing and/or bioassay. Studies and testing will be required to insure dredge/disposal activities do not threaten the continued existence of the shortnose sturgeon. Finally dredge/disposal activities should be scheduled to avoid interference with annual migration of anadromous fish.

PRELIMINARY SOCIAL ASSESSMENT

The lack of maintenance dredging in the Kennebec River would have an adverse impact on the operations at Bath Ironworks. This would have a significant adverse impact on the region. Many jobs depend on the continued full operation of the ironworks and therefore closing could cause unemployment to rise and accordingly adversely affect social atmosphere and regional economics. Continued maintenance will assure full operation of the ironworks and help to maintain the present social atmosphere and conditions.

RECOMMENDATIONS

In light of the favorable economic analysis presented above, the importance of Bath Ironworks on regional economy and social well being, and the potential importance of the ironworks for national defense reasons, it is recommended that maintenance dredging be continued in the Kennebec River to authorized depths as far north as Bath. No detailed study is considered necessary at this time for operation and maintenance of this project.

APPENDIX 1

MAINTENANCE OF THE 27-FOOT CHANNEL, KENNEBEC RIVER, FROM
THE MOUTH TO BATH, CONSTRUCTION COMPLETED DECEMBER 1943

<u>DATE</u>	<u>METHOD</u>	<u>WORK AREA</u>	<u>DISPOSAL AREA</u>	<u>C.Y. REMOVED</u>	<u>COST</u>
4 Aug 47 to 26 Aug 47	Hopper	Unknown	Unknown	93,835 Ordinary Material Bin Measurement	\$38,850
1 Nov 50 to 15 Nov 50	Hopper	Unknown	Unknown	108,830 Sand	\$27,546
25 Aug 53 to 24 Sept 53	Hopper	Unknown	Unknown	58,390 Pay Place + Natural Shoaling Ordinary Material	\$
2 Oct 55 to 12 Oct 55	Hopper	Unknown	Unknown	14,100 Pay Place + Natural Material Ordinary Material	\$30,208
August 1956	Hopper	Unknown	Unknown	4,707 Pay Place + Natural Shoaling	\$33,518
1 July 58 to 22 July 58	Hopper	Sect. I-Vic. of N. Sugarload Is. Sect. II-Doubling Pt. to Carlton Bridge	Sect. I-Sea Dump Sect II-Morse Cove Area	25,583 Ordinary Material Based on After Dredge Comps.	\$

MAINTENANCE OF THE 27-FOOT CHANNEL, KENNEBEC RIVER, FROM
THE MOUTH TO BATH, CONSTRUCTION COMPLETED DECEMBER 1943
 (continued)

<u>DATE</u>	<u>METHOD</u>	<u>WORK AREA</u>	<u>DISPOSAL AREA</u>	<u>C.Y. REMOVED</u>	<u>COST</u>
Aug 64 to Dec 64	Clamshell (Cont. Sea- board Engr.)	N. Sugarloaf Lee Island Doubling Pt. (Not Complete)	Sea Dump Sea Dump Morse Cove	14,400	\$45,000
3 July 67 to 12 July 67	Hopper	Doubling Pt. N. Sugarloaf Is.	Morse Cove Area Sea Dump	48,547 Pay Place + Excess of 15,630 (Total 64,177)	\$93,775
27 June 68 to 7 July 68	Hopper	N. Sugarloaf Is. Lee Is. Crow Is.	Sea Dump	32,070 Pay Place + 10,142 Excess (Total 42,212)	\$47,861
18 June 71 to 30 June 71	Hopper	Doubling Pt. Dix Is. Popham Reach	Morse Cove Sea Dump Sea Dump	54,534 Ordinary Material	\$129,880
12 June 75 to 30 June 75	Hopper	Doubling Pt.	Morse Cove	102,930 Ordinary Material	\$242,203